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In re patent application of

NOBUYUKI NISHI, ET AL.

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For: DIGITAL CAMERA

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Commissioner of Patents and Trademarks
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Sir:

I, TOSHIMASA SUZUKI, declare and state:

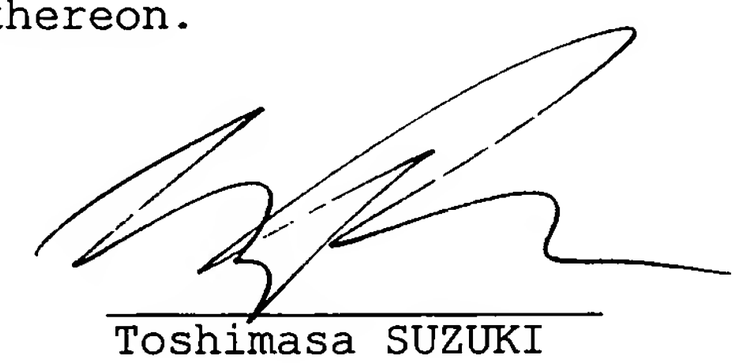
that I am a citizen of Japan, having an Office at P.O. Box 521, ARK Mori Building 13F, 12-32, Akasaka 1-chome, Minato-ku, Tokyo, 107 JAPAN;

that I well understand the Japanese and English languages;

that the attached English-language documents are full, true and faithful translations made by me of Japanese Application No. 2001-016918 filed on January 25, 2001 on which the rights of priority under the International Convention are all claimed for the

above-identified application.

I declare further that all statements made herein of my own knowledge are true that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the Application or any patent issuing thereon.



Date: September 14, 2005

Toshimasa SUZUKI

Patent Office
Japanese Government

This is to certify that the annexed is a true copy of the following application as filed with this Office.

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[JP2001-016918]

Applicant(s) : SEIKO EPSON CORPORATION

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Commissioner,
Patent Office Kozo Oikawa

Issuance Number Pat. 2002-3001499

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[Title of the Invention]	DIGITAL CAMERA
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[Filed Document Name]	Specification 1
[Filed Document Name]	Drawing 1
[Filed Document Name]	Abstract 1
[Number of General Power]	9901019
[Request for Proof]	Yes

[Name of Document] Specification

[Title of Invention]

Digital Camera

[Claims]

[Claim 1]

A digital camera characterized by comprising:

input means for inputting the image data;

first recording means for recording the input image data on a nonvolatile recording medium in a predetermined file format;

display means for displaying the image data recording on said nonvolatile recording medium;

dedicated interface means for accepting the input or edit of the preset data regarding said image data by one operation when the image data recorded on said nonvolatile recording medium is displayed on said display means; and

second recording means for recording said preset data with said image data on said nonvolatile recording medium in a predetermined file format.

[Claim 2]

The digital camera according to claim 1, characterized in that said preset data is the data for setting the number of printing the image data displayed on said display means.

[Claim 3]

The digital still camera according to claim 1 or 2,

characterized in that said dedicated interface means increments the number of printing the image data displayed on said display means for every operation.

[Claim 4]

The digital camera according to claim 1, 2 or 3, characterized in that said dedicated interface means has a push button switch.

[Claim 5]

The digital camera according to claim 4, characterized in that said push button switch is provided on the left as confronted to said display means.

[Claim 6]

The digital camera according to claim 1, characterized by further comprising a memory unit for memorizing a copy of the preset data recorded on said nonvolatile recording medium at least during a period for which said dedicated interface means can accept the input or edit of the preset data.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention Belongs]

The present invention relates to a digital camera, and more particularly to a digital camera with the preset data regarding the image data.

[0002]

[Prior Art]

In recent years, along with the rapid spread of the digital camera, there is an increasing demand for utilizing an image via a removable memory between devices, such that the image photographed by the digital camera is reproduced by another digital camera, or output directly to the printer. For this demand, the file format for recording the image photographed by the digital camera on a variety of kinds of removable memory has been standardized.

[0003]

One of the file formats for recording the preset data regarding the image data is the DPOF (Digital Print Order Format) (Version 1.00) as released in 1999, and the DPOF (Version 1.10) was publicized in 2000. In the DPOF (Version 1.10), the specified data for an image file to be printed, the specified data for the number of prints, the specified data for the image file for automatic transmission, and the specified data for the image file for automatic reproduction can be recorded as the preset data. In the digital camera that supports the DPOF, a determination whether or not to print the data can be made, or the number of prints can be specified, while confirming the photographed image on the LCD screen. And in the digital camera, since the required information for printing or transmission is recorded beforehand on the recording medium such as a memory card, there is no need of being nervous about the file name or path name at the time

of printing or transmission. Therefore, the DPOF is applied in various areas, including the laboratory print service or home printer, thereby making it easier to output the image data from the digital camera to the paper medium.

[0004]

[Problems that the Invention is to Solve]

However, when a DPOF file such as an automatic print file was created or edited by the conventional digital camera, it was necessary that some operations were taken to switch from other modes such as a reproduction mode to a specific mode for setting the DPOF, and another operation taken to determine whether or not to select and print an image and specify the number of prints in the specific mode.

[0005]

Fig. 9 shows one example of the operation for creating or editing an automatic print file in the conventional digital camera. For example, when an image desired for printing is found in a reproduction mode, a dial switch 101 is firstly rotated to switch over to a DPOF setting mode to make the DPOF setting for the image. Then, a push button switch 102 is depressed in succession to change the displayed image and search for the image to be printed. Then, a push button switch 103 is depressed to set the number of printing that image. Then, a push button switch 104 is depressed to determine the setting content and create or edit the DPOF file. Then, the

dial switch 101 is rotated to return to the reproduction mode or photographing mode. In this manner, in the conventional digital camera, the operation of creating or editing the DPOF file was some complex.

[0006]

The present invention has been achieved to solve the aforementioned problems, and it is an object of the invention to provide a digital camera that allows the preset data regarding the image data to be input and edited easily.

It is another object of the invention to provide a digital camera that takes a short time to make the operation for preset data.

[0007]

[Means for Solving the Problems]

According to a first aspect of the present invention, there is provided a digital camera, characterized by comprising input means for inputting the image data, first recording means for recording the input image data on a nonvolatile recording medium in a predetermined file format, display means for displaying the image data recording on the nonvolatile recording medium, dedicated interface means for accepting the input or edit of the preset data regarding the image data by one operation when the image data recorded on the nonvolatile recording medium is displayed on the display means, and second recording means for recording the preset data with the image

data on the nonvolatile recording medium in a predetermined file format.

[0008]

Since the dedicated interface means accepts the input or edit of the preset data regarding the image data by one operation, when the image data recorded on the nonvolatile recording medium is displayed on the display means, it is very easy to input and edit the preset data regarding the image data.

[0009]

The phrase "accepting the input or edit of the preset data regarding the image data when the image data is displayed on the display means" means that the input or edit of the preset data can be accepted in a state where the image data is displayed on the display means, and the input or edit of the preset data can be accepted by one operation in that state. More specifically, it means that when the digital camera is in the reproduction mode and a specific image is displayed on the entire LCD screen, an automatic print file of the DPOF is created by one operation such as "depressing once" or "rotating once", or the number of prints recorded in the automatic print file is incremented. The term "dedicated" for the dedicated interface means that the interface means has any other functions than the function of accepting the input or edit of the preset data, whereby the dedicated interface means is

provided to enable the preset data to be clearly understood and easily utilized.

[0010]

The preset data is the data for setting the number of printing the image data displayed on the nonvolatile recording medium, whereby it is very easy to preset the number of printing the image data.

The dedicated interface means increments the number of printing the image data displayed on the display means for every operation, whereby it is very easy to preset the number of printing the image data.

Also, the dedicated interface means has a push button switch, whereby it is easy to designate the preset data while carrying the digital camera.

[0011]

The push button switch is provided near the display means and on the left as confronted to the display means, whereby it is easy to designate the preset data while carrying the digital camera. More specifically, a plurality of switches are provided on the right as confronted to the display means in most cases, in which these switches may be operated by the dominant hand, except for the time of designating the preset data, and the preset data is designated with the undominant hand, only when required, thereby resulting in simpler and easier operation.

[0012]

The digital camera further comprises a memory unit for memorizing a copy of the preset data recorded on the nonvolatile recording medium at least during a period for which the dedicated interface means can accept the input or edit of the preset data, whereby the time for designating the preset data can be shortened. More specifically, when a processor built in the digital camera edits the preset data, for example, it is unnecessary to call the preset data from the nonvolatile recording medium into the memory unit, so that it takes a shorter time to designate the preset data.

[0013]

[Embodiments]

One embodiment of the present invention will be described below with reference to the accompanying drawings.

Figs. 2, 3, 4 and 5 are a front view, a rear view, a plan view and a functional block diagram of a digital still camera according to one embodiment of the invention, respectively. Input means as defined in the claims comprises an optical system 11, an area sensor 12, and an analog front end 13 (APE). A nonvolatile recording medium as defined in the claims is composed of a removable memory 18. First recording means is composed of an image generating section 14, a color space conversion section 15, a compression processing section 16, a file section 17, a CPU 20, and a memory device 19 (MS).

Display means as defined in the claims is composed of the CPU 20 and a display unit 22. Dedicated interface means as defined in the claims is composed of a part of an operation section 21 including a DPOF specific switch 41. Second recording means as defined in the claims is composed of the CPU 20, an MS 19 and the file section 17. The push button switch as defined in the claims is composed of the DPOF specific switch 41. The memory device as defined in the claims is composed of the MS 19.

[0014]

The optical system 11 is composed of an optical lens, an infrared cut filter, and an optical low-pass filter, and forms an image of a subject onto the area sensor 12.

The area sensor 12 is an optical sensor such as a CCD sensor or CMOS sensor having photoelectric conversion elements, each photoelectric conversion element being provided with a complementary color filter of C (Cyan), M (Magenta), Y (Yellow) or G (Green). The filter may be a primary color filter for R (Red), G (Green) or B (Blue). The photoelectric conversion elements are arranged like a matrix. An analog signal of each color output from the area sensor 12 is input into an AFE 13.

[0015]

The AFE 13 is composed of a program gain amplifier, a CDS circuit, and an A/D converter, and generates the digital data of 10 to 12 bits for each color of CMYG by sampling an

analog signal output from each photoelectric conversion element. Each digital data for CMYG is input into the image generating section 14 directly or after being stored in a buffer memory.

[0016]

The image generating section 14 is constituted by a hardware technique for controlling an ASIC in which a predetermined algorithm is implemented by a logic circuit with the CPU 20, or by a software technique employing a DSP (Digital Signal Processor) engine. In the case where the ASIC is used for the image generating section 14, there is a merit that the processing can be faster than the case where the image generating section 14 is constituted by software technique. The image generating section 14 makes the automatic exposure (AE) processing, the automatic white balance (AWB) processing, the image generation processing, the conversion processing from the CMYG color space into RGB color space, and the γ correction processing. The image generation processing as referred to herein mainly involves generating the image data having four values of CMYG colors for each pixel, employing the digital data representing the intensity of CMYG corresponding to an output of each photoelectric conversion element. The conversion processing from the CMYG color space into RGB color space is made by hardware technique with a 4×3 matrix operation processing circuit, or software technique

using a multiplication circuit and an addition or subtraction circuit.

[0017]

The color space converting section 15 is composed of a 3×3 matrix operation processing circuit, or constituted by software technique employing a multiplication circuit and an addition or subtraction circuit under the control of the CPU 20, and generates the YCbCr digital image data from the RGB digital image data by a linear transformation with a 3×3 matrix.

The compression processing circuit 16 is typically constituted by a hardware technique using a specific chip for the JPEG compression processing, but may be constituted by a software technique using the DSP. The compression processing section 16 makes the JPEG compression processing by the discrete cosine transform (DCT) or Huffman coding.

The file section 17 records the compressed image data in a removable memory 18 such as a compact flash memory in the Exif file format.

[0018]

The CPU 20 controls the optical system 11, the area sensor 12, the AFE 13, the image generating section 14, the color space conversion section 15, the compressing processing section 16, and the file section 17, and makes a reduction processing for the main image data made up of the YCbCr image data generated in the color space conversion section 15 to

generate the thumb-nail image data of 160×120 pixels in the MS 19. Various processings performed by the image generating section 14, the color space conversion section 15 and the compression processing section 16 may be implemented by software technique in which predetermined programs are executed by the CPU 20.

[0019]

The MS 19 temporarily memorizes the main image data made up of the YCbCr image data generated in the image generation section 14 and its reduced image data. The display section 22 is composed of a video memory, an LCD (Liquid Crystal Display) 38 and a drive circuit, and displays the thumbnail image data generated by the CPU 20 on the LCD 38. The operation section 21 is composed of a shutter button 30 provided on the upper surface of a case, a power supply switch 31, a dial switch 32, various setting switches 35, 36, 37, 39 and 40 provided around the LCD 38, a DPOF dedicated switch 41, and an input control circuit. The DPOF dedicated switch 41 is a push button switch provided on the back face of the digital still camera 1 on the left as confronted to the LCD 38.

[0020]

The constitution of the digital still camera 1 has been described above. A DPOF file will be described below.

The DPOF file generated or edited by operating the DPOF dedicated switch 41 is recorded in an MISC directory made under

the route directory of the removable memory 18, as shown in Fig. 6. The DPOF file is composed of an automatic print file, an automatic transmission file, and an automatic reproduction file. The automatic print file will be only described in the following. This invention is also applicable to the automatic transmission file and the automatic reproduction file.

[0021]

The automatic reproduction file is composed of a header portion and a job description portion; as shown in Fig. 7. The header portion contains the version information of DPOF. The job description portion contains the print type related with the product ID, the print number of sheets, and the path for image data. When printing, the preset data such as the print type and the print number of sheets described in the job description portion can be associated with the specific image data via the path for image data. Accordingly, an output device such as a printer can read a DPOF file to create a print job of the specific image data for each product ID in accordance with the print type and the print number of sheets, whereby there is no need of making the settings at the time of printing.

[0022]

The DPOF dedicated switch 41 is effective when the digital still camera 1 is in the reproduction mode to display the still image, in the photographing mode to make the simple reproduction, immediately after photographing to display the

still image, or in the automatic frame feed mode to display the still image. That is, in any of the above modes, if the DPOF dedicated switch 41 is depressed during execution of each module for implementing these functions, a DPOF setting module is started.

[0023]

The DPOF setting module activates the digital still camera in accordance with a flowchart as shown in Fig. 8. At STEP1, it is determined whether or not an automatic print file is memorized in the MS 19. If no automatic print file is memorized in the removable memory 18, the data for the header portion is generated at STEP2, and stored in a predetermined area of the MS 19.

[0024]

At STEP3, it is determined whether or not there is any product associated with the image data displayed on the LCD 38 at present by retrieving the job description portion of the automatic print file. The image data display on the LCD 38 at present and the product are associated by the ID appended to an image file, when the image file is recorded in the removable memory 18, for example. The presence or absence of the product associated with the image data may be determined in such a manner as to hold the file ID of image data displayed on the LCD 38 in the MS 19, and the file ID of an image file for each product, and retrieve the job description portion with the

file ID of image data displayed on the LCD 38 as a retrieval key.

[0025]

If the product associated with the image data displayed on the LCD 38 at present is not present in the job description portion, a new product is created at STEP4. That is, the product ID but for other product IDs is generated, and memorized in a predetermined area of the MS 19. Further, at STEP5, the print number of sheets for its product ID is set to 1. Then, at STEP6, the file ID of image data displayed on the LCD 38 at present is recorded. If the product associated with the image data displayed on the LCD 38 at present is present in the job description portion, the print number of sheets is incremented by one at STEP7. STEPs 4, 5, 6 and 7 are set forth as separate steps in succession for convenience' sake, but these steps are not necessarily divided explicitly, and may be provided as one step or in another sequence, or provided with different contents. In essence, if the product associated with the image data displayed on the LCD 38 at present already exists, the print number of sheets is incremented by one, or otherwise is set to 1. It is desirable that the set print number of sheets is displayed on the LCD 38.

[0026]

At STEP8, the preset information memorized in the MS19, namely, the automatic print file, is recorded in the removable

memory 18. At this time, the automatic print file is not deleted from the MS 19, and a copy of the automatic print file recorded in the removable file 18 is saved in the MS 10. In this manner, the period from the time of operating the DPOF dedicated switch 41 to the time of completion of editing the DPOF file can be shortened. But a copy of the DPOF file placed in the MS 19 may be deleted to utilize the memory capacity of the MS 19 efficiently when transferring to a mode of displaying the image of the subject formed in the area sensor 12 on the LCD 38. If deleted, the copy may be saved in the MS 19 by calling the DOPF file from the removable memory 18 prior to operating the DPOF dedicated switch 41, when transferring to the mode of displaying the still image on the LCD 38. Thereby, even when the DPOF dedicated switch 41 is operated after transferring to a mode of editing the DPOF file, the period from the time of operation to the time of completion of editing the DPOF file can be shortened.

[0027]

The above operation for creating and editing the automatic print file at STEP1 to STEP8 is initiated by depressing the DPOF dedicated switch 41, as shown in Fig. 1. That is, when the digital still camera 1 is in the reproduction mode to display the still image, in the photographing mode to make the simple reproduction, immediately after photographing to display the still image, or in the automatic

frame feed mode to display the still image, printing the image data displayed on the LCD 38 and the print number or incrementing the print number by one can be specified only by depressing the DPOF dedicated switch 41. For example, if the DPOF dedicated switch 41 is firstly depressed while the still image is being displayed in the reproduction mode, the print number of the image data being displayed is set to one, and if the DPOF dedicated switch 41 is depressed successively without changing the display image, the print number of the image data is set to two. Since the mode is not changed before and after the DPOF dedicated switch 41 is depressed, if the still image is being displayed in the automatic frame feed mode immediately before the DPOF switch 41 is depressed, the frame feed is continued in that mode, even after the DPOF dedicated switch 41 is depressed.

[0028]

Accordingly, with the digital still camera 1 of this embodiment, the input or edit of the print specification and specification of the number of prints for the image data can be accepted by one operation of the DPOF dedicated switch when the image data is displayed on the LCD 38, whereby the preset data regarding the image data is easily designated. Also, with the digital still camera 1 of this embodiment, the DPOF dedicated switch 41 is composed of the push button switch, which is provided on the back face of the digital still camera

1 on the left as confronted to the LCD 38, whereby it is easy to operate the DPOF dedicated switch 41 while carrying the digital still camera 1. Also, with the digital still camera 1 of this embodiment, since the automatic print file is not deleted from the MS 19, and a copy of the automatic print file recorded in the removable memory 18 is saved in the MS 19, the period from the time when the DPOF dedicated switch 41 is operated to the time of completion of editing the automatic print file can be shortened.

[0029]

The DPOF files such as the automatic transmission file and the automatic reproduction file other than the automatic print file, to which the invention is applied, will be described below.

For the automatic transmission file, it suffices that a product for specifying the transmission for the image data displayed on the LCD 38 may be created by depressing the DPOF dedicated switch 41. The transmission destination may be input by operating a switch other than the DPOF dedicated switch 41 in the digital still camera 1, or input from the system using the DPOF dedicated file. For the automatic reproduction file, it suffices that a product for specifying the reproduction for the image data displayed on the LCD 38 may be created by depressing the DPOF dedicated switch 41. The order of reproduction may be the order in which the DPOF

dedicated switch is depressed, or specified in accordance with the number of depressing the DPOF switch 41.

[Brief Description of the Drawings]

Fig. 1 is a typical view for explaining the preset operation for printing according to one embodiment of the present invention.

Fig. 2 is a front view of a digital still camera according to one embodiment of the invention.

Fig. 3 is a rear view of the digital still camera according to one embodiment of the invention.

Fig. 4 is a plan view of the digital still camera according to one embodiment of the invention.

Fig. 5 is a block diagram of the digital still camera according to one embodiment of the invention.

Fig. 6 is a typical tree diagram for explaining the directory structure for a DPOF file according to one embodiment of the invention.

Fig. 7 is a typical diagram for explaining the contents of the DPOF file according to one embodiment of the invention.

Fig. 8 is a flowchart showing the operation of the digital still camera according to one embodiment of the invention.

Fig. 9 is a typical diagram for explaining the preset operation for printing in the conventional digital still camera.

[Description of Reference Numerals and Signs]

1 digital still camera

11 optical system

12 area sensor

13 analog front end

14 image generation section

15 color space conversion section

16 compression processing section

17 file section

18 removable memory

19 main memory unit

21 operation section

22 display section

38 LCD

41 DPOF dedicated switch

[Name of Document] Abstract of the disclosure

[Abstract]

[Object]

To provide a digital still camera that is easy to input or edit the preset data regarding the image data.

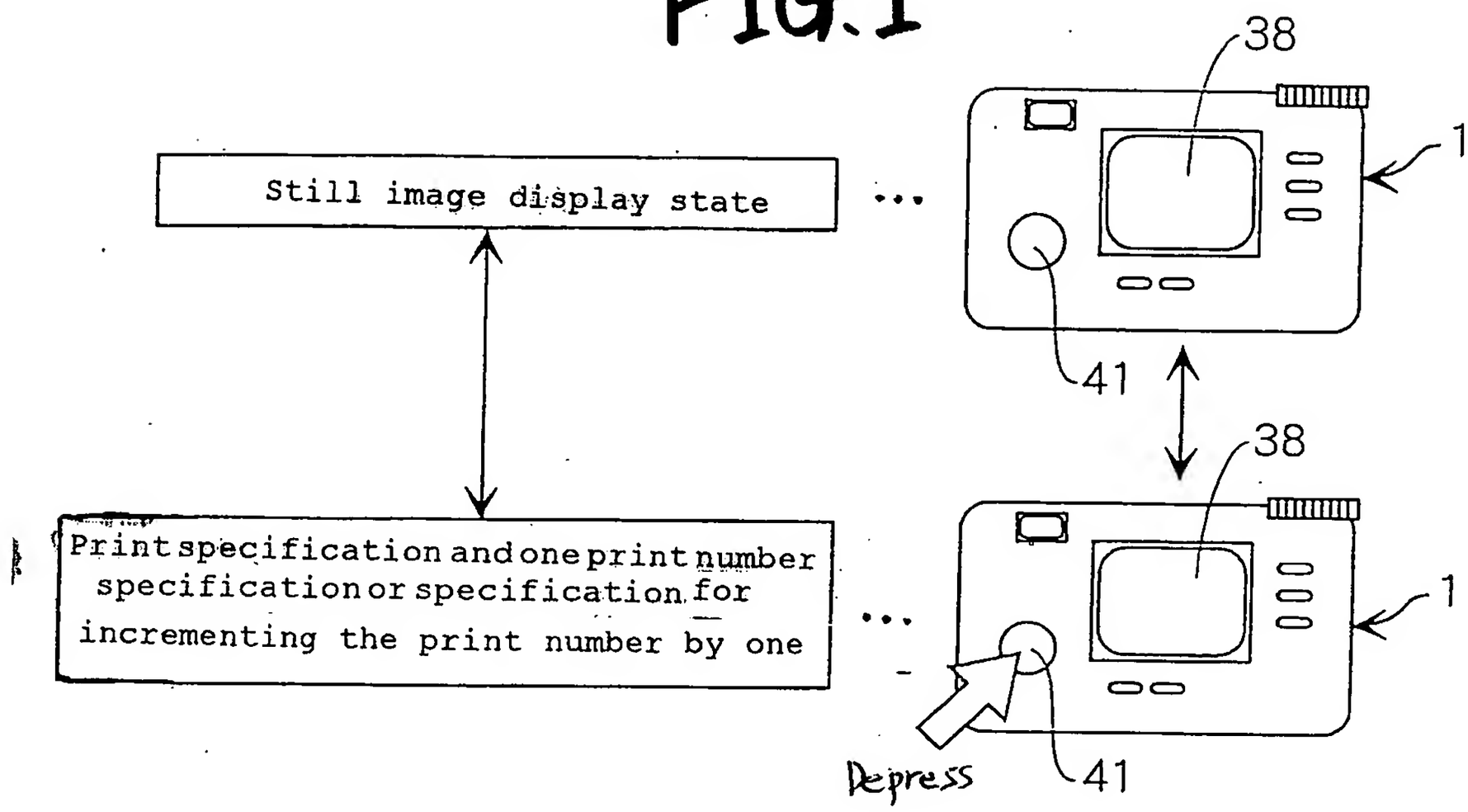
[Solving Means]

Printing the image data displayed on an LCD 38 and its print number or incrementing the print number by one can be specified only by depressing a DPOF dedicated switch 41 while the still image is being displayed on the LCD 38. For example, if the DPOF dedicated switch 41 is depressed when still image is being displayed in a reproduction mode, the print number of displayed image data is set to one, and if the DPOF dedicated switch 41 is depressed successively without changing the displayed image, the print number of the image data is set to two.

[Selected Drawing]

Figure 1

FIG.1


Still image display state
Print specification and one print number specification or specification for incrementing the print number by one
38
1
41
38
1
Depress
41

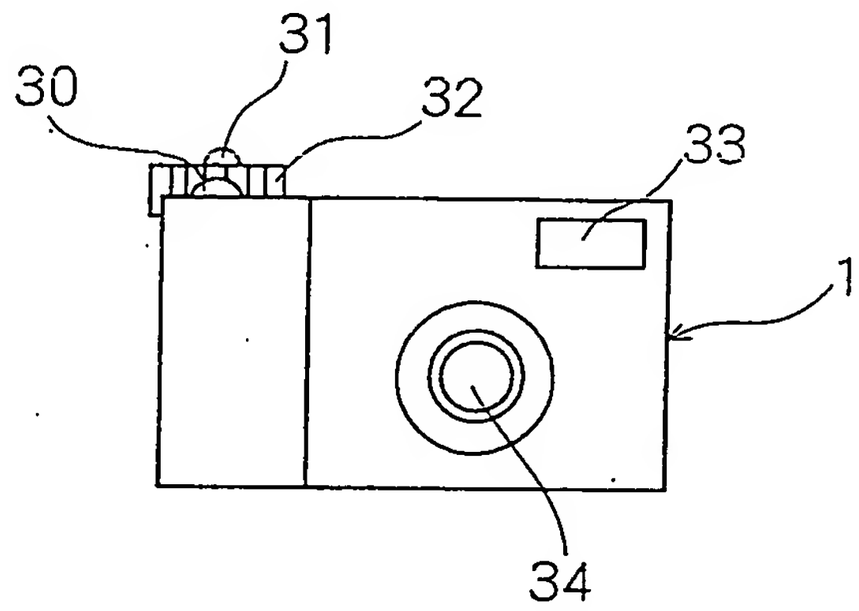

31
30
32
33
1
34

FIG.2

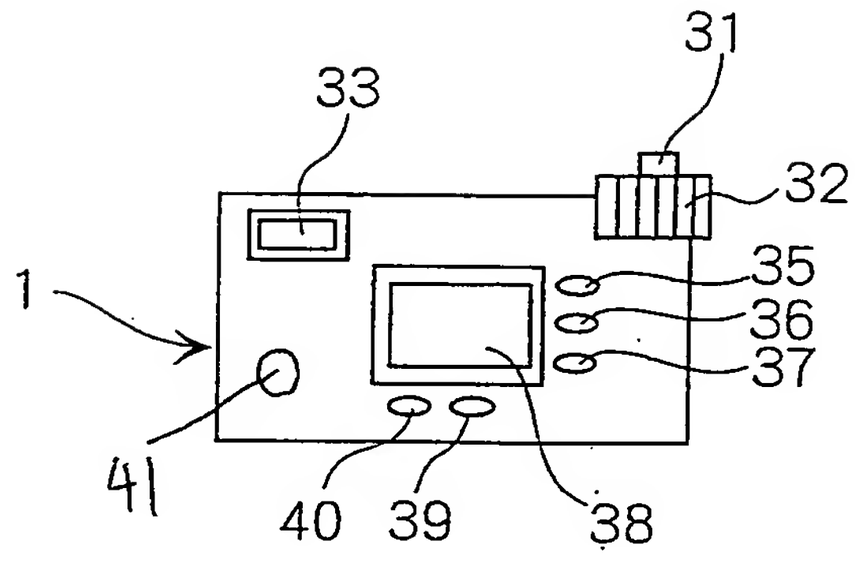


FIG. 3

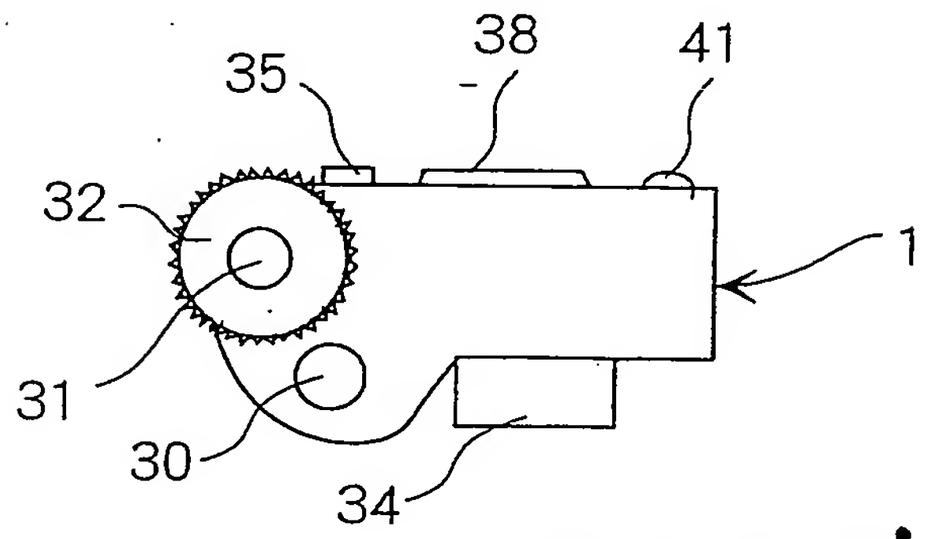


FIG. 4

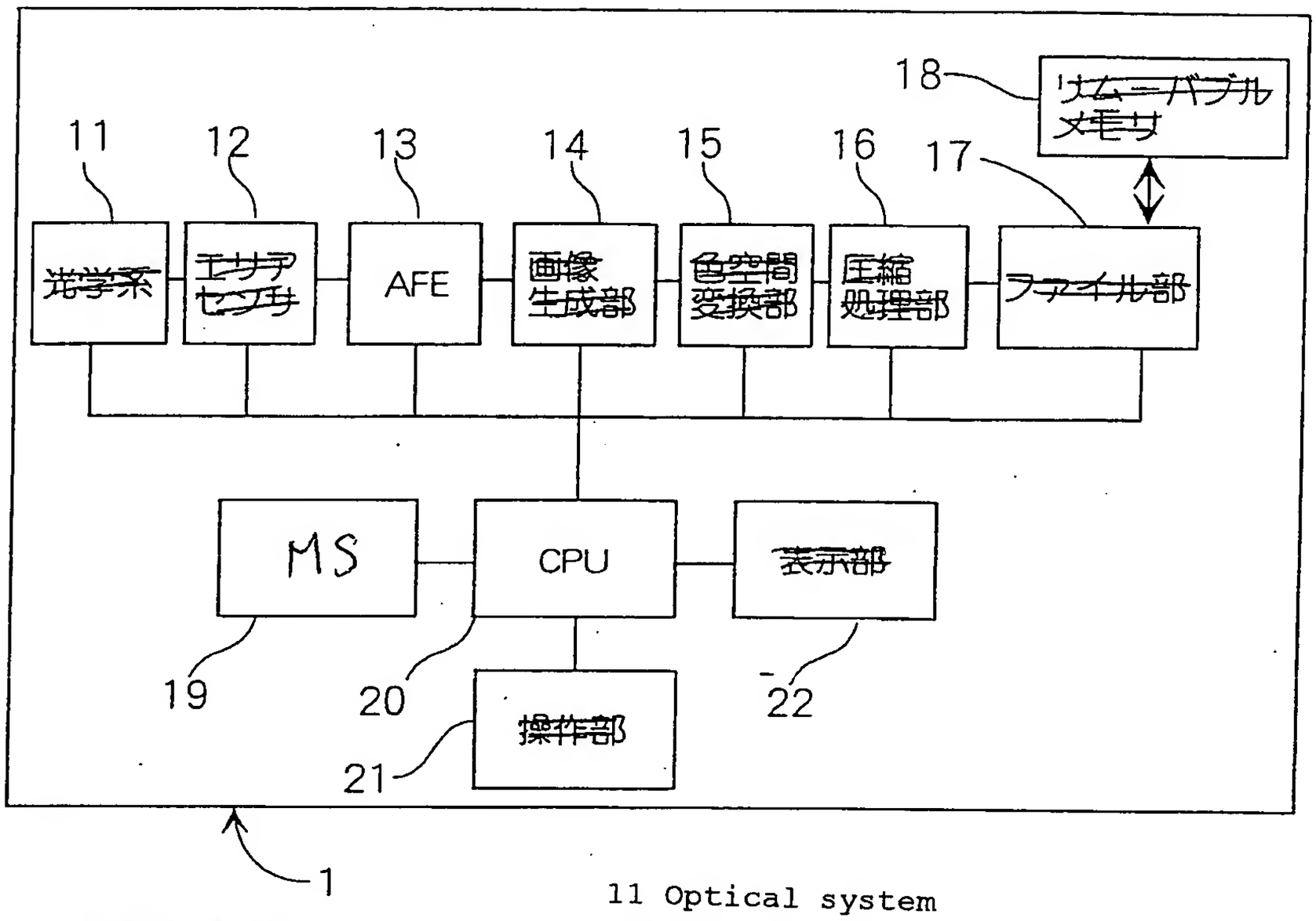


FIG. 5

11 Optical system
12 Area sensor
14 Image generation section
15 Color space conversion section
16 Compression processing section
17 File section
18 Removable memory
21 Operation section
22 Display section

FIG.6

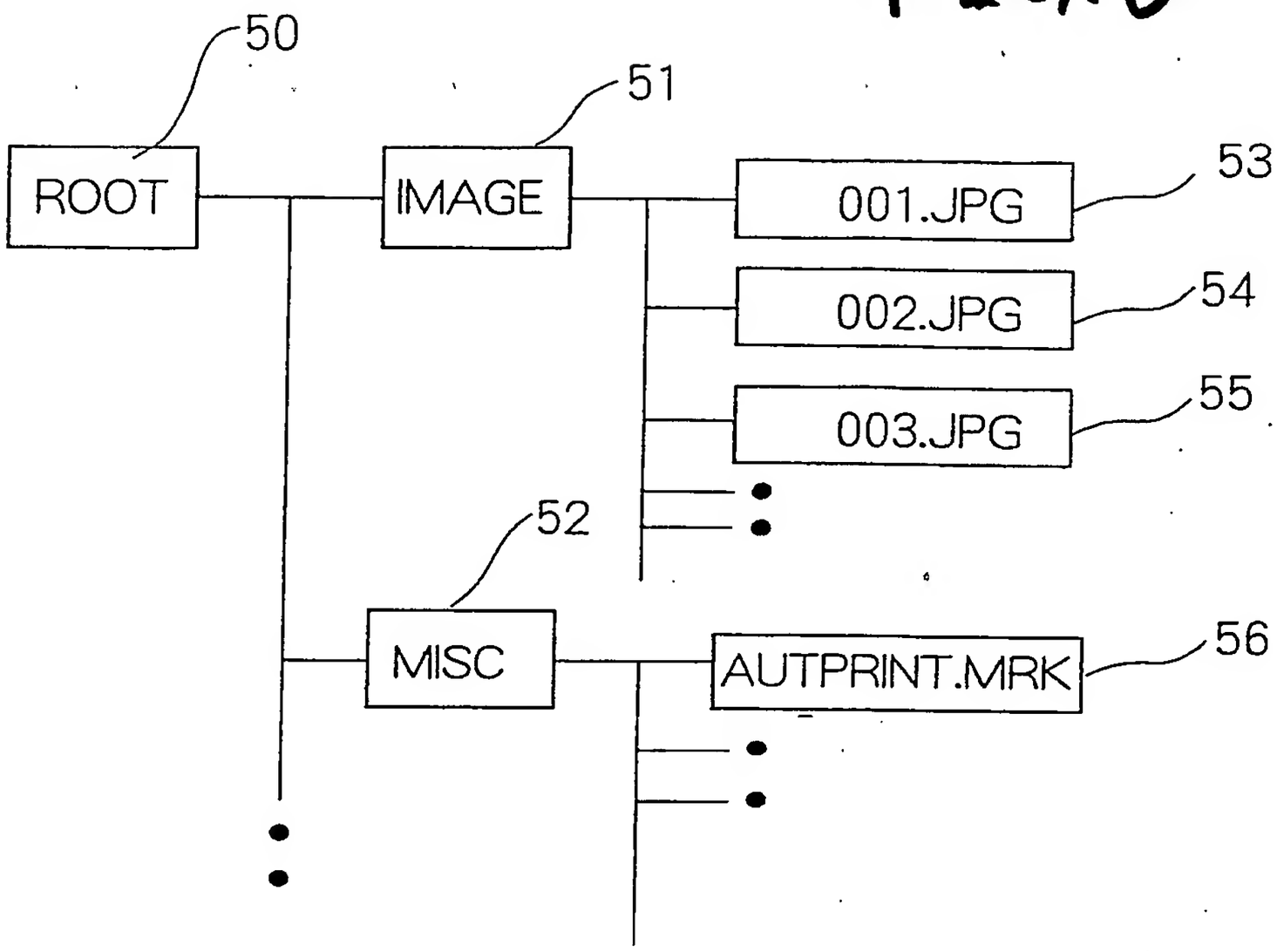
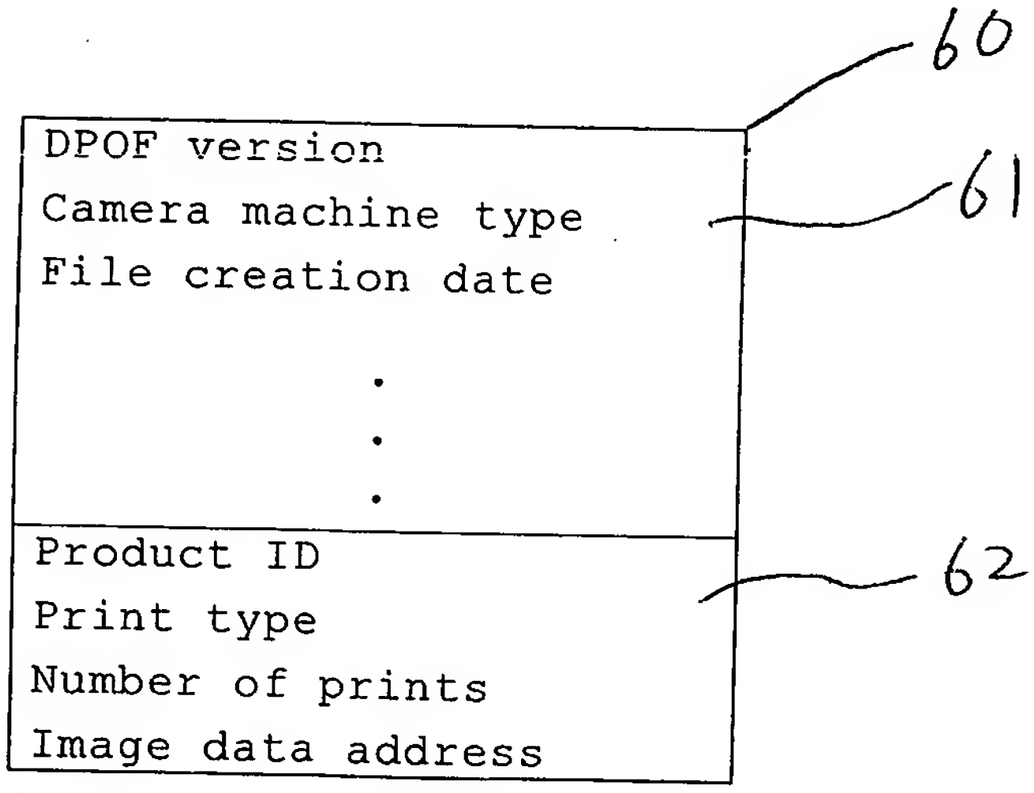

50
51
ROOT
IMAGE
001.JPG
53
002.JPG
54
003.JPG
55
52
MISC
AUTPRINT.MRK
56

FIG.7


60
DPOF version
Camera machine type
61
File creation date
Product ID
Print type
Number of prints
Image data address
62

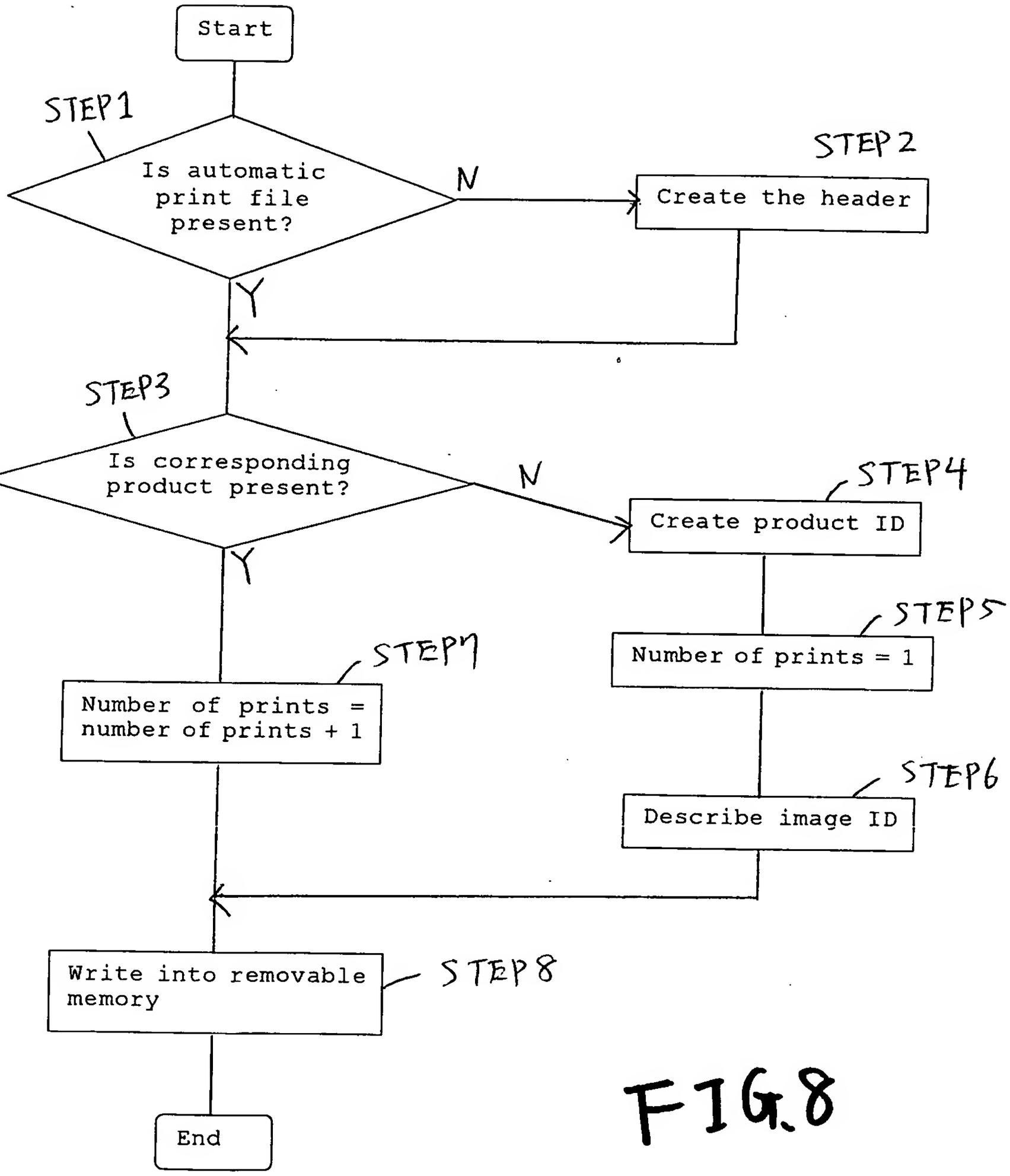

Start
STEP1
Is automatic print file present?
N
Y
STEP2
Create the header
STEP3
Is corresponding product present?
N
Y
STEP4
Create product ID
STEP5
Number of prints = 1
STEP6
Describe image ID
STEP7
Number of prints = number of prints + 1
Write into removable memory
STEP8
End

FIG.8

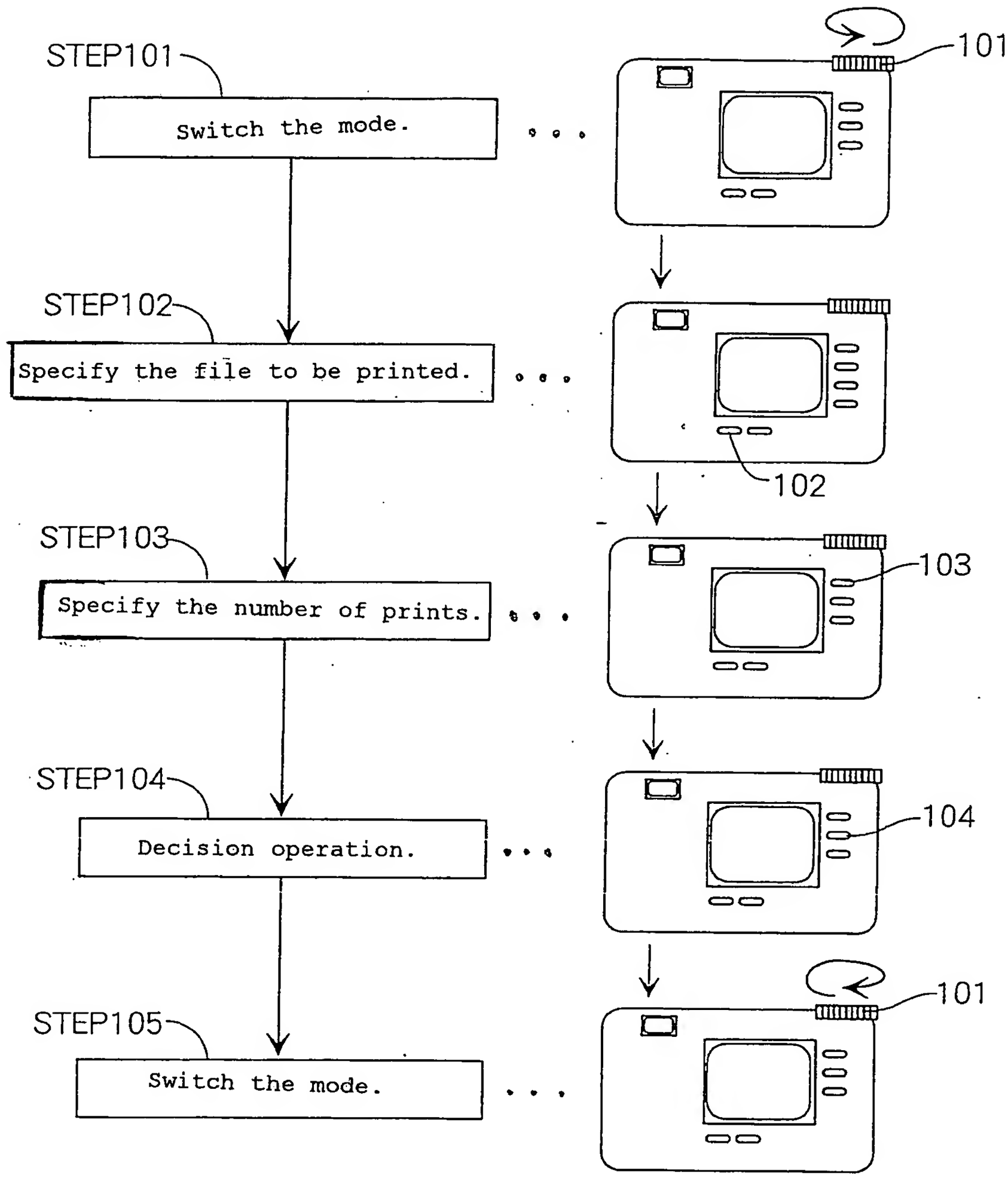

STEP101
Switch the mode.
101
STEP102
Specify the file to be printed.
102
STEP103
Specify the number of prints.
103
STEP104
Decision operation.
104
STEP105
Switch the mode.
101

FIG. 9